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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/709,278	04/26/2004	Wen-Liang Lien	NAUP0560USA	3277

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EXAMINER	
LEE, KYOUNG	
ART UNIT	**PAPER NUMBER**
2812	

DATE MAILED: 09/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/709,278	LIEN ET AL.	
	Examiner	Art Unit	
	Kyoung Lee	2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04/26/2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) *8,9, 12, and 13* is/are rejected.

7)☐ Claim(s) *1-7, 10, and 11* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

The disclosure is objected to because of the following informalities: In line 2 of the paragraph [0011] of Summary of the Invention, Applicants recite "a semiconductor substrate with a low-k dielectric layer(k≤2.9)thereon". The examiner suggests replacing "a semiconductor substrate with a low-k dielectric layer (k≤2.9) thereon". In line 4 of the paragraph [0018] of the Detailed Description, Applicants recite "The Ar plasma comprises a flurane substance. The flurane substance could be CF_4". The examiner suggests replacing "The Ar plasma comprises a fluorine substance. The fluorine substance could be CF_4". In line 1 of the paragraph [0020] of the Detailed Description, Applicants recite "In the third-stage, as shown in Fig. 12,a single damascene". The examiner suggests replacing "In the third-stage, as shown in Fig. 12, a single damascene". In line 5 of the paragraph [0020] of the Detailed Description, Applicant recite "the low-k dielectric layer 12.Then, a metal layer". The examiner suggests replacing "the low-k dielectric layer 12. Then, a metal layer". In line 7 of the paragraph [0023] of the Detailed Description, Applicants recite "as shown in Fig.14,theviaopening 38". The examiner suggests replacing "as shown in Fig.14, via opening 38". Appropriate correction is required.

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

Claims 1, 3, 4, 8, 10, and 11 are objected to because of the following informalities: In claim 1, Applicants recite "low-k dielectric layer(k≤2.9)thereon". The examiner suggests replacing "low-k dielectric layer (k≤2.9) thereon". In claim 1, Applicants recite "anti-reflection coating(BARC) layer". The examiner suggests replacing "anti-reflection coating (BARC) layer".

In claim 3, Applicants recite "The Ar plasma comprises a flurane substance". The examiner suggests replacing "The Ar plasma comprises a fluorine substance".

In claim 4, Applicants recite "the flurane substance is CF_4". The examiner suggests replacing "the fluorine substance is CF_4".

In claim 8, Applicants recite "low-k dielectric layer(k≤2.9)thereon". The examiner suggests replacing "low-k dielectric layer (k≤2.9) thereon". In claim 8, Applicants recite "low-k dielectric layer from contacting overlying resist". The examiner suggests replacing "low-k dielectric layer from contacting an overlying resist".

In claim 10, Applicants recite "The Ar plasma comprises a flurane substance". The examiner suggests replacing "The Ar plasma comprises a fluorine substance".

In claim 11, Applicants recite "the flurane substance is CF_4". The examiner suggests replacing "the fluorine substance is CF_4".

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 8, 9, and 13 rejected under 35 U.S.C. 102(b) as being anticipated by Chung-Shi Liu (U.S. Patent No. 6,294,457).

In claim 8, Liu disclose a method for a damascene process capable of avoiding via resist poisoning, the damascene process comprising:

Providing a semiconductor substrate with a low-k dielectric layer ($k \leq 2.9$) thereon (18), and a SiC layer over the low-k dielectric layer (20);

Forming a blocking layer on the SiC layer (22), wherein the blocking layer is used to prevent unpolymerized precursors diffused out from the low-k dielectric layer from contacting an overlying resist;

Forming a BARC layer on the blocking layer (24);

Forming a resist layer on the BARC layer (30), where the resist layer has a via opening to expose a portion of the BARC layer; and

Etching through the BARC layer, the blocking layer, and the SiC layer, and etching a portion of the low-k dielectric layer to form a single damascene structure in the low-k dielectric layer (see figure 3 and column 2, line 66 through column 3, line 27).

In claim 9, Liu disclose a method for wherein the blocking layer is formed by Ar plasma hitting the SiC layer (see column 3, lines 10-16).

In claim 13, Liu disclose a method wherein the thickness of the SiC layer is less than 700 angstroms (see column 3, lines 5-7).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 12 rejected under 35 U.S.C. 103(a) as being unpatentable over Chung-Shi Liu (U.S. Patent No. 6,294,457) in view of Chang et al (U.S. Patent No. 6,642,153).

In claim 12, Liu disclose the method as claimed and rejected above, but does not teach the method forming a low-k dielectric layer comprises a carbon-doped oxide substance. Chang disclose the method forming a low-k dielectric layer comprises a carbon-doped oxide substance (see column 4, lines 40-44). It would have been obvious to one of ordinary skill in the art at the time the invention was made to wherein the low-k dielectric layer comprises a carbon-doped oxide substance in the method of Liu in order to lower value of k dielectric layer and to protect the low k carbon doped silicon oxide dielectric material from damage during removal of photoresist mask.

Allowable Subject Matter

Claim 1-7 would be allowed if amended to overcome the objections cited above.

The following is an examiner's statement of reasons for allowance: the prior art, either singly or in combination, fails to anticipate or render obvious, the method including the limitations of forming a blocking layer on the surface of the trench structure, forming a second BARC layer on the blocking layer, forming a second resist layer on the second BARC layer, and etching through the second BARC layer, the SiC layer and the blocking layer, and etching a portion of the low k dielectric layer with the other limitation of claim 1.

Claim 10 and 11 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the prior art, either singly or in combination, fails to anticipate or render obvious, the method including the limitations of wherein the Ar plasma comprises a fluorine substance and fluorine substance is CF_4. Liu discloses a formation of blocking layer of Silicon dioxide by using Ar sputter system but Liu does not teach Ar plasma comprises a fluorine substance and fluorine substance is CF_4. It would not have been obvious to one of ordinary skill in the art at the time the invention was made to wherein the Ar plasma comprises a fluorine substance and fluorine substance is CF_4.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure Sukharev at al (U.S. Patent No. 6,114,259).

Sukharev disclose method for treating exposed surface of a low-k carbon doped silicon oxide dielectric material in order to protect the low k carbon doped silicon oxide dielectric material from damage during removal of photoresist mask.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kyoung Lee whose telephone number is (571) 272-1982. The examiner can normally be reached on M-F 8:30AM - 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael S. Lebentritt can be reached on (571) 272-1873. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KL

JENNIFER KENNEDY
PRIMARY EXAMINER